Helpful Hints

on Preparing a Research Grant Application to the National Institutes of Health

R 31/10

HE 20.3002:

READEX FICHE

Helpful Hints

on Preparing
a Research Grant
Application to the
National Institutes
of Health

Introduction

This brochure contains several suggestions, based on the experiences of National Institutes of Health (NIH) staff, to assist you in preparing an NIH research grant application. While nothing can substitute for significant research, innovative ideas, and sound methodology, we nevertheless hope that these suggestions will help you avoid some errors often made by applicants and enable you to submit an application with the best chances for being successful in today's highly competitive biomedical research world.

Read the Instructions Carefully.

The language in the instructions to the application kit (PHS 398) has been carefully chosen. Yet too many applicants skim over these pages before plunging in. As a result, they are faced with unnecessary problems during the review of their applications. Some key areas are discussed below.

- **Page Limitations**

  Specific Aims Section: 1 page

  Significance Section: 3 pages

  Progress Reports and Preliminary Studies: 8 pages

  Biographical Sketches: 2 pages for each person (key professional staff only)

Lack of observance of these page limitations may result in your application being returned. Even if your application is not returned, reviewers with heavy workloads may not be pleased at having to read extra pages. Don't use photoreduction to cram more information into the allotted space. The gain in words will more than be offset by the irritation of a reviewer with eyestrain.

But note that the most important part of the application, the Experimental Design and Methods Section, has no page limitations. Although the instructions ask you to "make every attempt to be succinct," they also ask you to explain "in detail" the experimental design and procedures.

- **Budgets**

Prepare a well-justified budget. Describe the role of all personnel, both professional and nonprofessional, even if no salary is requested. Provide a reasonable indication of the percentage of time and effort on the project for each professional, and be careful that the sum of each individual's percentages of time and effort for *all* professional activities does not exceed 100 percent. Thoroughly justify all proposed purchases of major pieces of equipment. If the requested equipment appears to duplicate what is already available at your organization, or if the reviewers feel you are adding supplies indiscriminately, these items will probably be cut. Travel, especially foreign travel, must be justified in detail. Don't ask for funds to attend meetings that are not related to the research area of your application.

But what about your budget strategy? Should you deliberately inflate the budget because "most reviewers automatically reduce budgets"? Or should you underestimate what is needed to do the research adequately so that the reviewers will think the NIH is getting a bargain?

Avoid these temptations and prepare a realistic budget. Reviewers are instructed to evaluate the budget only in terms of whether it is realistic and justified in relation to the aims and methods of the proposed project. Deliberate overbudgeting or underbudgeting will often backfire, for reviewers will feel that you do not fully understand the requirements of the research. They will question your ability to manage the grant, which may be reflected by a lack of enthusiasm for your project.

- **Research Involving Human Subjects**

If the research involves human subjects and is not exempt from human subject review, you must include a completed, signed HHS 596 form. Your application will not be reviewed without this form.

In addition, you must provide information pertaining to six items described in Section 2-E of the instructions in the application kit. These six items include: the characteristics of the subjects, the sources of research materials, recruitment plans and consent procedures, any potential risks, procedures for protecting against or minimizing potential risks, and potential benefits to the subjects and to mankind. If you fail to include this information, your application may be deferred. Your goal should be to include enough information in a sufficiently clear fashion so that reviewers will not question exactly what you propose to do.

- **Research Involving Vertebrate Animals**

Be sure to justify their selection and use, and include additional information if the animals are in short supply, costly, or to be used in large numbers. Important considerations are whether the work will be planned and performed by qualified scientists, and whether the maintenance and veterinary care of the animals will ensure that they will be treated humanely and will not experience any unnecessary discomfort, pain, or injury.

- **Appendices**

These are useful for photographs, oversized documents and other materials that do not reproduce well. For competing continuation

and supplemental applications include completed manuscripts and publications since the last review. Be sure to put any graphs, diagrams, tables, or charts that are essential to the evaluation of your research plan in the text of the application, not in an appendix. Remember to submit six sets of appendices with your application.

- **Literature Citations**

Do not list references in the body of the text. Also, the list of citations at the end of your research plan should be relevant and current and need not be exhaustive. Padding this list with repetitious or out-of-date entries is not likely to impress reviewers and may even be counterproductive.

Take the Same Care in the Development of Your Ideas as You Would for a Scientific Publication.

As with a scientific publication, you should present your research logically and clearly, and show that your research is meaningful. Explicitly describe your hypothesis and how it will be tested. Be sure that your proposed project has coherent direction, that the various sections are well-coordinated and are clearly related to a central focus.

Refer to the literature thoroughly and thoughtfully. Explain what gaps in the literature would be filled by your project. In the past, applications have received poor priority scores or been disapproved when investigators seemed to be unaware of relevant published work or when the proposed research or study design had already been tried and judged inadequate.

Where appropriate, include well-designed tables and figures. Formulate titles that are accurate and informative.

Try to develop a clear, concise, coherent scientific writing style. A few guidelines that may prove useful include: (1) using the active voice, which is more direct, less wordy, and less confusing than the passive voice; (2) keeping together related ideas and information, for example putting clauses and phrases in sentences as

close as possible to the words they modify; (3) simplifying and shortening overly long and involved sentences and paragraphs; and (4) eliminating redundant and awkward words, phrases, and sentences.

Be sure to allow time for a thorough editing and proofreading of your application. Ironically, many scientists who are extremely precise in their research procedures do not take the same care in presenting their research. A sloppy application with typographical and grammatical mistakes, information omitted, and unclear statements makes a poor first impression on reviewers. They may wonder about the care you will devote to the actual research.

If you cannot comfortably meet the deadline, consider stepping back and submitting your best effort for the next receipt date.

Don't Assume that Reviewers will "Know What You Mean."

Discuss in detail the experimental design and procedures to be used to accomplish the specific aims of your project. While you may safely assume that the reviewers are experts in the field and familiar with current methodology, they will not make the same assumption about you. Thus, it is not sufficient merely to state that "a variety of viruses will be grown in cells using standard *in vitro* tissue culture techniques." The reviewers will want to know which viruses, which cells, and which techniques, as well as the rationale for using the particular virus-cell system and exactly how the techniques will be used. The burden of proof is on you to show, through a clear, succinct, yet detailed explication, that you understand and are capable of handling the research methodology.

Include Potential Pitfalls and Alternative Approaches.

Since the reviewers are experienced research scientists, they will undoubtedly be aware of possible problem areas, even if you don't include them in your research plan. But they have no way of knowing that you too have considered these problem areas unless you fully discuss any potential pitfalls and alternative approaches.

Seek Appropriate Advice.

Allow time for a presubmission review at your own organization. This review, which must obviously be informal and fast, could be either by a small committee or by one or two colleagues. As representatives of the scientific community who will review your application at the NIH, they can offer invaluable advice by pointing out unclear statements and other potential problem areas.

You might also consider contacting a member of the NIH staff for advice on preparing an application. Their advice may help you avoid possible difficulties and present your project as effectively as possible.

For Revised Applications, Be Sure the Changes are Significant and Clearly Identified.

Carefully analyze the summary statement from your previous application to determine from the reviewers' critique whether the proposed research is hopelessly flawed or whether it can probably be improved enough to be considered for an award. A second opinion is often valuable in this decision. It would be wise to have a colleague who is not involved in your proposed research review your previous application, summary statement, and revision plans.

When you revise an application, follow the instructions in the PHS 398 application kit. Thus, you should include an explanation of how you have responded to the critique in the previous summary

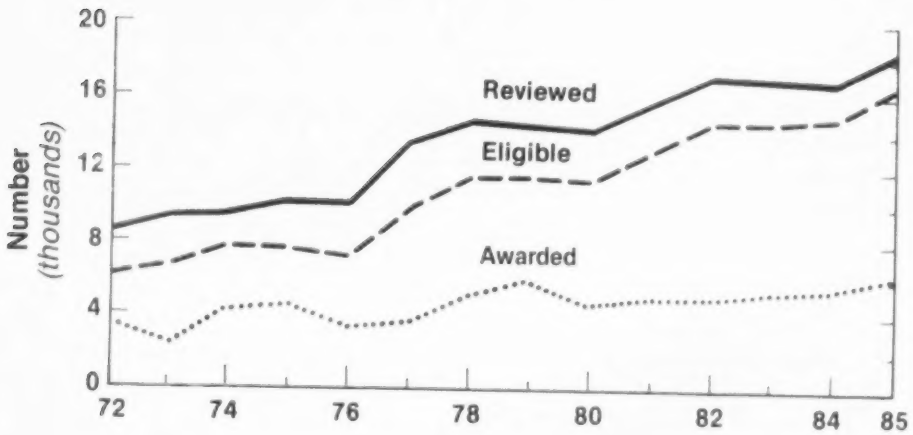
statement and what significant changes have been made. In addition, identify the changed areas in the text of the application by indenting, bracketing, underlining, or changing the type of the appropriate passages. For revised competing continuation or supplemental applications, incorporate in the progress report any work done since the prior version was submitted. If you follow these procedures, this will both assist the reviewers in reassessing your application and also help avoid having the application returned because there are no significant revisions.

NOTE: Even if you respond adequately to all the criticisms in the summary statement, there is no guarantee of an award. First of all, as is implied in its name, the summary statement is a summation of the review proceedings and is not meant to be exhaustive. Also when you change certain aspects of the application, you always run the risk of introducing new problems. Finally, the membership of an initial review group or study section is constantly changing, with about a fourth of the group new each year. Therefore, your application will probably be reviewed by some new individuals, who may have different views of your proposed research. Many but certainly not all revised applications receive NIH support. Those applicants who are successful carefully consider the comments in the summary statement, but do not rely exclusively on them.

Don't Despair.

Although the competition for biomedical research grant support from the NIH has become increasingly tough in recent years, the situation is far from hopeless. You still have a reasonable chance for success if your proposed project is scientifically meritorious and if your application is well developed and carefully prepared. Data about award rates are shown in the following graph.

Number of NIH Competing Research Project Applications Reviewed, Eligible and Awarded, Fiscal Years 1972-1985



The number of competing research project grant applications has risen dramatically—from 8,596 in fiscal year (FY) 1972 to 18,675 in FY 1985, an increase of over 100 percent. The number of applications approved and thus eligible for award has matched this trend, increasing from 6,141 in FY 1972 to 16,763 in FY 1985. The number of actual awards, however, has fluctuated greatly, from a low of 2,591 in FY 1973 to a high of 6,247 in FY 1985. In general, the award rate has declined. Thus, in FY 1972, approximately 50 percent of the approved or eligible competing research project grant applications were funded; but by FY 1985, this award rate had fallen to 37.3 percent.

The NIH, however, has still managed to fund over 5,000 competing research project grants for the past several years, and the FY 1985 figure of 6,247 was an increase of 754 awards or 14 percent from the previous year. Furthermore, new principal investigators have consistently entered the NIH system at a healthy rate. For example, from FY 1980 through FY 1984 on competing research project grants (RO1), an average of 25.4 percent of the principal investigators were new investigators. Thus the situation for applicants is difficult but not impossible.

For Additional Information

Cuca, Janet Mele: **"NIH Grant Applications for Clinical Research: Reasons for Poor Ratings or Disapproval."** *Clinical Research* 31:453-461, 1983.

Eaves, George N.: **"The Project-grant Application of the National Institutes of Health."** *Federation Proceedings* 32 (5):1541-1550, 1973.

Eaves, George N.: **"Review of Research Grant Applications at the National Institutes of Health."** *Proceedings from a Workshop on Thinking and Writing Clearly: Preparing an Application for Support* 3-11, 1982.

Eaves, George N.: **"A Successful Grant Application to the National Institutes of Health: Case History."** *Grants Magazine* 1 (3):263-286, 1978.

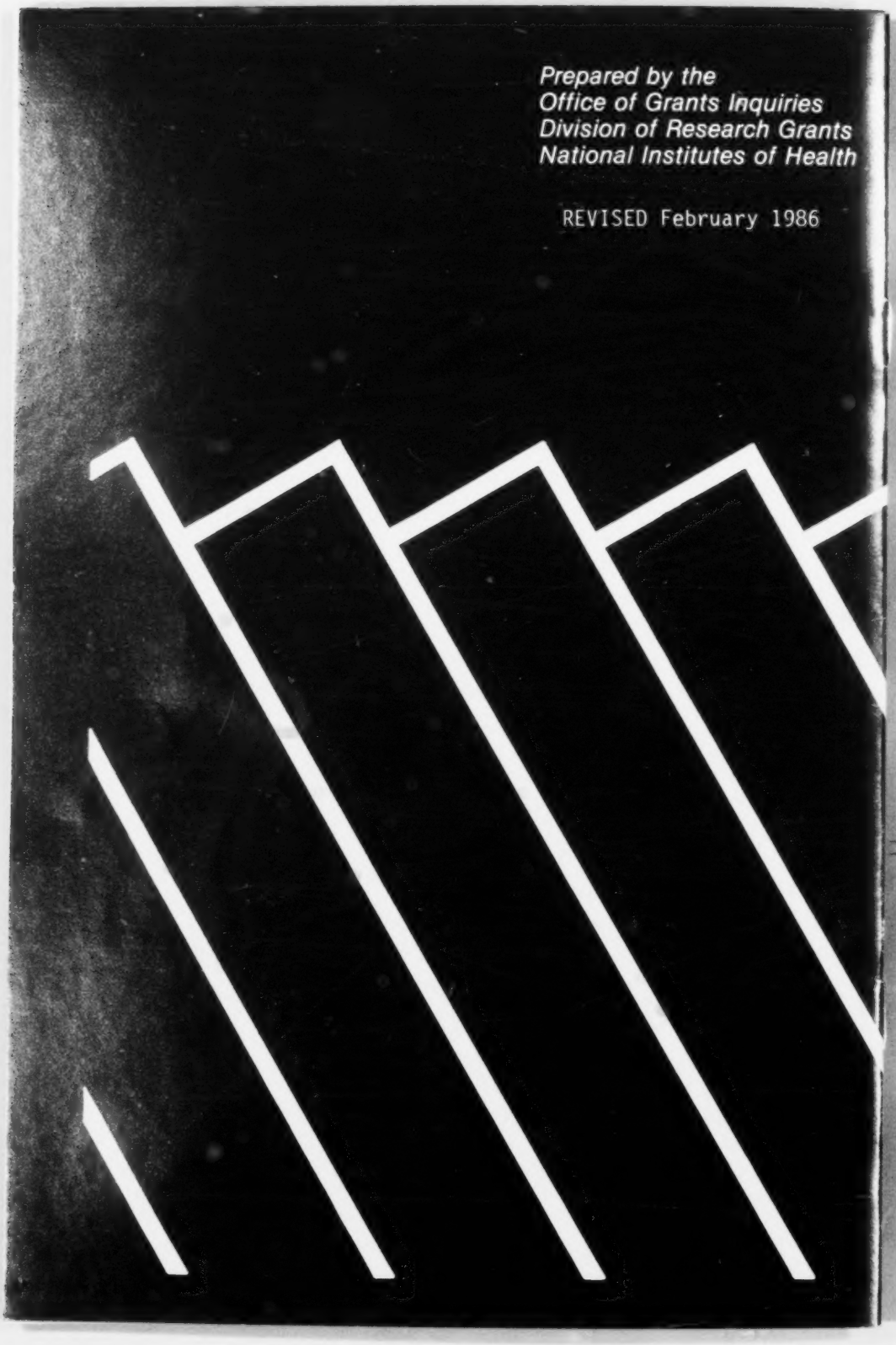
Henley, Catherine: **"Peer Review of Research Grant Applications at the National Institutes of Health."** *Federation Proceedings* 36 (8-10):2066-2068, 2186-2190, 2335-2338, 1977.

Merritt, Dorris H. and Eaves, George N.: **"Site Visits for the Review of Grant Applications to the National Institutes of Health."** *Federation Proceedings* 34 (2):131-136, 1975.

Murphy, Donald G. and Dean, Donna J.: **"Application and Review Procedures for the National Institutes of Health Small Business Innovation Research Program."** *Institute Insight:* 1-12, 1984.

Novello, Antonio C.: **"The Peer Review Process: How to Prepare Research Grant Applications to the NIH.** *Journal of Mineral Electrolyte Metabolism* 11 (5): 1985.

Copies of these articles are available from:
Office of Grants Inquiries
Division of Research Grants
National Institutes of Health
Bethesda, Maryland 20892
Phone: (301) 496-7441


Prepared by the
Office of Grants Inquiries
Division of Research Grants
National Institutes of Health
REVISED February 1986